

Patent Claims

1. Apparatus (1) for producing continuously molded bodies (5) from a molding material, such as a spinning solution containing cellulose, water and tertiary amine oxide, comprising a multitude of extrusion orifices (4) through which during operation the molding material can be extruded into continuously molded bodies (5), a precipitation bath (9), an air gap (6) arranged between the extrusion orifices (4) and the precipitation bath (9), and a blowing means (14) for producing a cooling gas stream (15), the continuously molded bodies (5) being passed during operation in successive order through the air gap (6) and the precipitation bath (9), and the cooling gas stream (15) being directed in the area of the air gap (6) to the continuously molded bodies (5), **characterized in** that the cooling gas stream (15) is turbulent at least at the exit from the blowing means (14).
2. The apparatus according to claim 1, **characterized in** that the cooling gas stream (15) has a Reynolds number (Re) of at least 2,500, based on its width (B), measured substantially in the direction of passage (7) of the continuously molded bodies (5) through the air gap (5), and on its velocity in the direction of flow (15), and the viscosity (ν) of the cooling flow medium.
3. The apparatus according to claim 2, **characterized in** that the Reynolds number is at least 3,000.
4. The apparatus according to any one of the aforementioned claims, **characterized in** that the velocity of the cooling stream (15) is at least 30 m/s.
5. The apparatus according to claim 4, **characterized in** that the velocity of the cooling gas stream (15) is at least 40 m/s.

6. The apparatus according to claim 5, **characterized in** that the velocity of the cooling stream (15) is at least 50 m/s.
7. The apparatus according to any one of the aforementioned claims, **characterized in** that the width of the cooling stream at the exit is not more than 2 mm.
8. The apparatus according to claim 7, **characterized in** that the width of the cooling gas stream at the exit is not more than 1 mm.
9. The apparatus according to any one of the aforementioned claims, **characterized in** that the specific blowing force of the cooling gas stream (15) is at least 5 mN/mm.
10. The apparatus according to claim 9, **characterized in** that the specific blowing force of the cooling gas stream (15) is at least 10 mN/mm.
11. The apparatus according to any one of the aforementioned claims, **characterized in** that the cooling gas stream (15) is turbulent in the area of the first row of continuously molded bodies (5) on which it impinges.
12. The apparatus according to any one of the aforementioned claims, **characterized in** that the air gap (6) comprises a first shielding zone (20) by which the cooling gas stream (15) is separated from the extrusion orifices.
13. The apparatus according to claim 12, **characterized in** that apart from the first shielding zone (20) it comprises a second shielding zone (21) through which the cooling area (19) is separated from the precipitation bath surface (11).
14. The apparatus according to claim 1 or 2, **characterized in** that the boundary area (18a) facing the extrusion orifices (4) and located between the cooling area (19) and the first shield-

ing zone (20) extends substantially in parallel with a plane in which the extrusion orifices (4) are positioned on average.

15. The apparatus according to any one of the aforementioned claims, **characterized in that** the extrusion orifices (4) are arranged on a substantially rectangular base in rows in a direction transverse to the direction (16) of the cooling gas stream (15).
16. The apparatus according to claim 4, **characterized in that** the number of the extrusion orifices (4) in row direction is greater than in the cooling gas stream direction (16).
17. The apparatus according to any one of the aforementioned claims, **characterized in that** the precipitation bath (9) has disposed therein a deflector (10) by which during operation the continuously molded bodies (5) are deflected as a substantially planar curtain (8) to the precipitation bath surface (11), and that outside of the precipitation bath there is provided a bundling means (14) by which during operation the continuously molded bodies (5) are united to form a fiber bundle (13).
18. The apparatus according to any one of the aforementioned claims, **characterized in that** the width (D) of the cooling gas stream (15) in a direction transverse to the direction of passage (7) of the continuously molded bodies (5) through the air gap (6) is larger than the height (B) of the cooling gas stream in the direction of passage.
19. The apparatus according to any one of the aforementioned claims, **characterized in that** the cooling gas stream (15) is composed of a plurality of individual cooling gas streams.
20. The apparatus according to claim 8, **characterized in that** the individual cooling gas streams are arranged side by side in row direction.

21. The apparatus according to any one of the aforementioned claims, **characterized in that** the cooling gas stream is designed as a turbulent air flow in the area where the continuously molded bodies (5) are passed through the air gap (6).
22. The apparatus according to any one of the aforementioned claims, **characterized in that** the cooling gas stream (15) has a velocity component oriented into the direction of passage (7).
23. The apparatus according to any one of the aforementioned claims, **characterized in that** the molding material prior to its extrusion has a zero shear viscosity of at least 10000 Pas, preferably at least 15000 Pas, at 85°C.
24. The apparatus according to any one of the aforementioned claims, **characterized in that** the distance of the cooling area (19) from each extrusion orifice (4) in the direction of passage (7) is at least 2 mm each time.
25. The apparatus according to any one of the aforementioned claims, **characterized in that** the distance l of the cooling area (1) in the direction of passage (7) from each extrusion orifice (4) in millimeters satisfies the following inequality:

$$l > H + A \cdot [\tan(\beta) - 0.14]$$

where H is the distance of the upper edge of the cooling gas stream in the direction of passage from the plane of the extrusion orifices at the exit from the blowing means (14) in millimeters, A is the distance in a direction transverse to the direction of passage between the exit of the cooling gas stream (15) of the blowing means (14) in millimeters and the row (22) of the continuously molded bodies (5) that is the last one in flow direction (16), in millimeters, and β is the angle in degrees between the cooling gas stream direction (16) and the direction transverse to the direction of passage (7).

26. The apparatus according to any one of the aforementioned claims, **characterized in that** the height L of the air gap (6) in the direction of passage (7) in millimeters satisfies the following inequality:

$$L > l + 0.28 \cdot A + B$$

where l is the distance of the cooling area (19) from the extrusion orifices (4) in the area where the continuously molded bodies (5) are passed through the air gap (6), A is the distance in a direction transverse to the direction of passage (7) between the exit of the cooling gas stream (15) from the blowing means (14) and the row (22) of the continuously molded bodies (5) that is the last one in flow direction (16), in millimeters, and B is the height of the cooling gas stream (15) in a direction transverse to the cooling gas stream direction (16) in the direction of passage (7) at the exit of the cooling gas stream (15) from the blowing means (14).

27. A method for producing continuously molded bodies (5) from a molding material, such as a spinning solution containing water, cellulose and tertiary amine oxide, the molding material being first extruded to obtain continuously molded bodies, the continuously molded bodies being then passed through an air gap (6) and stretched in said air gap and exposed to a cooling gas stream (15) from a blowing means (14), and the continuously molded bodies being then guided through a precipitation bath (9), **characterized in that** the cooling gas stream (15) is put into a turbulent flow state by the blowing means (14) at least at the exit from the blowing means (14).